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ABSTRACT

This paper provides an overview of the effects of otitis media on the learning and behavior of children and youth. It begins by describing the conductive hearing loss that is caused by otitis media and the classroom behavior that can result, including poor concentration and attention, disobedience, irritability, and poor social skills. Discussed are the limitations of past research, which has focused on young children, and a proposed new research project to establish whether or not the problems identified continue to affect children as they grow older and possibly no longer suffer from fluctuating, conductive hearing loss. The proposed project will include 60 students from a large, urban high school who have had no history of middle ear problems and those with a history of middle ear problems. (Contains 28 references.) (CR)

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Otitis Media: Implications of Fluctuating, Conductive Hearing Loss on Learning and Behaviour in High School Age Students.

Paper by Jan Stenton

Definition of Otitis Media:

Otitis media (inflammation of the middle ear) is a general term used for a number of conditions that affect the middle ear. They range from acute to chronic, with and without symptoms. Over the last thirty years there has been a great deal of discussion regarding the terms used to described the various conditions associated with otitis media. Consistent, internationally accepted terminology has been established at four symposia (Klein, Tos, Hussl, Naunton, Ohyama & van Cauwenberge, 1989).

Frequently, the terms otitis media and middle ear infections are used interchangeably but this is not an accurate procedure. Middle ear inflammation with progressive tissue damage may proceed without middle ear infection being present. This process may be acute, subacute or chronic (Giebink & Daly, 1990).

Acute otitis media is generally defined as the first three weeks of middle ear infection and is usually accompanied by ear pain, decreased hearing and possibly fever. Subacute otitis media is defined as middle ear inflammation lasting for three to eight weeks without symptoms except for a mild, conductive hearing loss associated with the middle ear fluid. Chronic otitis media is regarded as middle ear inflammation lasting longer than eight weeks and it may exist with or without middle ear fluid being present.

Otitis media is further classified on the basis of middle ear fluid characteristics and middle ear tissue pathology. The fluid may be thin and clear (serous), thin and cloudy (purulent), or thick and gluelike (mucoid). In one third of otitis media with effusion cases there is

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little or no effusion (Giebink et al, 1990).

When middle ear fluid is present for at least eight weeks without the presence of otorrhea (a discharge from the ear) and without clinically apparent tissue damage, the condition is referred as chronic otitis media with effusion (OME).

Otitis media with effusion is characterised by the presence of fluid in the middle ear space without signs or symptoms of infection. Otitis media with effusion has also been referred to in the literature as:

serous otitis media mucoid otitis media tympanic hydrops
secretory otitis media secondary otitis media glue ear
allergic otitis media hydrotubotympanum fluid ear
catarrhal otitis media exudative catarrh middle ear effusion
nonsupporative otitis media tubotympanitis tubotympanic catarrh
noninfected middle ear effusion

The major symptoms associated with otitis media with effusion include discomfort and behaviour changes. (Agency for Health Care Policy and Research, Publication No 94-0623, 1994).

It is frequently difficult to decide by history and visual inspection of the tympanic membrane the specific stage and type of otitis media (Bluestone & Klein, 1988). Often, uncertainty remains as to the content of the fluid and the presence or absence of infectious agents but the signs and symptoms of acute infection are lacking. According to Scheidt & Kavanagh (1986) reports of pathogenic organisms cultured from serous fluid previously thought to be infection-free have added to this uncertainty. The term otitis media with effusion was introduced in the later 1970s to allow for the uncertainty in the actual composition of the middle ear fluid and whether or not infection is present. The term otitis media with effusion avoids specifying any

distinctions in the type of fluid present and is limited to the observation that fluid of a non-specific nature is present in the middle ear space.

After the onset of acute otitis media, fluid may persist in the middle ear space for varying periods of time. Whatever the cause of the acute otitis media, an unresolved condition where the fluid remains in the middle ear space for a period of time from 2 weeks or longer is known as persistent otitis media with effusion. However, when infections of the middle ear occur repetitively such as four to five times over a defined period of six month or a year the condition is referred to as recurrent otitis media. It is important that a clear distinction between recurrent, separate episodes of otitis media and persistent otitis media with effusion be made as their impact on conductive hearing loss differs.

What is already known regarding the medium and long term effects of Otitis Media with Effusion:

The problem with otitis media with effusion is that the effusion causes a conductive hearing loss. This hearing loss can last for six months and it can fluctuate depending on the type of otitis media with effusion. The hearing loss associated with otitis media with effusion is usually mild ie 10 dB - 30 dB and is not always evident to parents and teachers. The Australian Conductive Deafness Association Inc. maintains that on any given day one out of three primary school age children will have some degree of conductive hearing loss as a result of otitis media with effusion (Teachers! Can Your Pupils Hear You?, 1994).

At the Second National Conference on Childhood Fluctuating, Conductive Deafness organised by the Australian Conductive Deafness Association Inc. it was clear that many studies have been done on infants and young

primary age children with a history of otitis media with effusion. Some of these studies (including Dermody 1995 and Haggard 1995) have found that children with fluctuating, conductive hearing loss have speech processing and speech perception difficulties.

The Australian Conductive Deafness Association Inc. maintains that children with fluctuating, conductive hearing loss are often identified by their behaviour. This behaviour includes poor concentration and attention, disobedience, irritability and poor social skills. Howard (1995) suggests that the consequences of otitis media contribute to behaviours that fit the diagnostic criteria of Attention Deficit Disorder.

Bench and Harold (1995) have designed a model to explain how the above sequelae develop from otitis media with effusion. Their model suggests there is a progression from the onset of a mild, conductive, hearing loss through the development of speech and auditory processing difficulties, metalanguage problems and learning problems to social, behavioural problems.

It is well established in the research that children who suffer from fluctuating, conductive hearing loss are at risk of developing learning and behavioural problems. However, the research to date has been undertaken with young children ie children from birth to approximately ten years of age. The purpose of this research is to establish whether or not the problems identified continue to affect children as they grow older and possibly no longer suffer from fluctuating, conductive hearing loss. Does this common childhood problem affect the learning and behaviour of junior high school students? Rarely have we looked to improve the educational opportunities of adolescents by exploring physical factors from early childhood.

Moore & Best (1988), in a study of 1 111 children in Melbourne, Victoria, found that 33% of the children investigated had an undetected

hearing loss of at least 35 dB. A further 20% had normal hearing combined with some degree of middle ear dysfunction, demanding careful follow-up. This unexpectedly high incidence of otitis media with effusion and abnormal ear dysfunction was of concern because otitis media with effusion has been described as a precursor of auditory learning problems in children.

According to Hasenstab (1987) interruption of the language learning process theoretically interferes with the acquisition of communication competence. However, it is not clear as to how much interference is needed before the required skills are not acquired successfully. Hasenstab (1987) also makes the point that a fluctuating, conductive, hearing loss may make the acquisition of language skills and more complex cognitive abilities more difficult than they are for the child with a sensorineural loss because of the inconsistent auditory input.

In a study with a group of sixty children aged from 5 years 3 months to 6 years 6 months and divided into two groups: an otitis media with effusion group and a control group Hasenstab (1992) found deficits in the ability of the experimental group to process and represent auditory information. Auditory and visual immediate recall for sequential patterns was below expectations and cognitive abilities exceeded performance. It takes time to process auditory information and the children in the experimental group needed more processing time than those in the control group. Tests which Hasenstab used in this study to assess auditory tasks were the Nonsense Syllable Test, Pitch Pattern Perception Test and Backward Masking. Tests to assess learning and communication included the McCarthy Scales of Children's Abilities, Kaufman Assessment Battery for Children, the Assessment of Phonological Processes and a communication sample analysis (based on a video tape recording of children's interactions).

It would be easy to assume that if children with a history of otitis media with effusion experience the difficulties described by Hasenstab, then they would present with educational difficulties more frequently

than the non affected population. Dwyer (1992) surveyed the files of 301 primary school children from grades prep to six who presented in a private practice for educational assessment. The files were examined for a history of hearing difficulties, including assessment of hearing and consequent advice or action. The results of this survey must be evaluated with some caution as all the children presented in a clinical setting because of learning difficulties and, as such, they represent a specialised group. However, the reduced phonemic sensitivity of these children was greater than expected. They had increased difficulty with tasks requiring phonemic sensitivity and the application of phonics knowledge. Dwyer suggests that further research needs to be carried out on the learning difficulties of the otitis media with effusion population.

In a follow up study of the epidemiological Nijmegen Otitis Media study Grievink, Peters, van Bon & Schilder (1993) examined a total of 946 seven year old children otologically and audiologically. These children had all taken part in a previous three year study when they were aged between 2 and 4 years of age. From this group 305 were given language tests. Tests used included two subtests from the Language Tests for Children (van Bon, 1982), to establish the children's general language ability. The morphological Word Forms Production Test was also used because it has been demonstrated to be a good indicator of a general language factor. In this study the researchers came to the conclusion that parents and teachers need not be overly concerned about the effects of otitis media with effusion on later language development, however, they did acknowledge that the results may have been because they used different language tests at age 3 and age 7 and that existing differences possibly were missed by the language tests chosen.

Hall and Grose (1994) investigated the effects of otitis media with effusion on basic auditory abilities using a control group of 19 children and an experimental group of 42 children who had a history of

otitis media with effusion. Testing involved three masking conditions. Hall and Grose found that children who have a hearing loss due to otitis media with effusion are likely to have reduced monotic Comodulation Masking Release ie they have difficulty in segregating competing sounds.

Yonowitz, Yonowitz, Nienhuys & Boswell (1995) studied central auditory processing in the hope of revealing a link between otitis media with effusion and problems with auditory attention, speech discrimination and with subsequent language and learning problems. Their experimental group consisted of 12 Aboriginal children who spike Tiwi as their first language and English as their school language. Their mean age was 7.9 years. The comparison group was 12 English speaking non Aboriginal children (mean age =7.7 years) and none of these had a history of otitis media with effusion or hearing impairment. The results indicated highly significant differences in the Masked Level Difference between the two groups.

Dermody (1992) at the First National Conference on Childhood Fluctuating, Conductive Deafness / Otitis Media addressed issues related to middle class urban children and focused on the possible language consequences of middle ear problems. He suggested that there is evidence for developmental problems associated with otitis media with effusion including speech perception, attention and behaviour problems as well as speech production problems. He suggested that the link between these developmental aspects and otitis media with effusion requires further investigation.

On the basis of these studies future research in the area of otitis media with effusion should concentrate on specific areas of language (eg auditory processing, auditory discrimination, acquisition of meaning, visual processing etc) rather than on the broad topic of language. Also it appears that behaviour could very likely be involved in the sequelae of otitis media with effusion but so far this is mainly based on theoretical supposition rather than research findings.

The Research Approach to be Used in the Study:

Design

The purpose of this research is to ascertain if there is a relationship between a history of otitis media with effusion and learning and / or behaviour. A correlational design is an appropriate approach. Scores will be obtained related to learning and behaviour from a selected sample of students with varying histories of otitis media with effusion. These scores will be analysed so that an interpretation can be made as to whether or not there is a relationship between a history of otitis media with effusion and learning and / or behaviour.

Sample

Sixty students from a large, urban, state, high school.

Three groups of students grouped according to their middle ear history

Group A: control group - no history of middle ear problems.
Group B: research group 1 - history of middle ear problems - no grommets.
Group C: research group 2 - history of middle ear problems - had grommets.

All to have English as their first language.

14 years of age ie turning 14 during 1998.
Sample to contain no students with a previously diagnosed condition such as Down Syndrome, Autism Spectrum Disorder etc which may affect language, behaviour or both.

Data Collection Techniques:

Learning Area:

School academic results will be collected. Suitable normed instruments may be used to gather data on students' language and communication abilities. The actual tests or testing methods have not yet been decided upon, however, it is expected that they will include an analysis of both spoken and written language skills.

Behaviour Area:

School records will be accessed regarding detentions, suspensions etc. Questionnaires will be used to gather data from parents, students and school staff.

Procedure:

Permission to undertake the study in a selected state high school (possibly Cleveland State High School) will be requested from Education, Queensland. When this permission is received and following discussions with the school administration regarding the details of the study a letter (see Appendix A) will be sent home to all Year 9 students requesting permission from their parents for them to take part in the study.

A questionnaire (see Appendix B) will be sent home with the letter so that those parents who choose to participate in the study will be able to give their permission and provide background information on their student's middle ear history in the one procedure. The questionnaire will request details regarding the students' past history of ear infections and the presence or not of certain other conditions and behaviours. From the information received from this questionnaire sixty students will be selected to participate in the study. The students will be selected according to their middle ear history

resulting in a cross sample of students who have experienced no ear infection history, students with a history of severe ear infections (more than ten episodes) but no grommet insertion and students who were fitted with grommets at some time. Students who have other, predetermined, diagnosed conditions will not be included in the study.

Data Analysis:

Multiple correlational measures will be used to indicate the degree of association between age, gender, history of otitis media with effusion and learning and behaviour.

A post hoc analysis may be done if there is a cohort of students from the Australian indigenous population within the overall sample.

Key Issues:

Internal Validity

The sample has been selected so that as many variables as possible have been controlled, however, there are issues regarding validity which still need further consideration.

A major difficulty regarding validity in this study will be the identification of a history of otitis media with effusion within the sample. As the students are 14 years of age and otitis media with effusion is generally present during childhood it may be difficult for parents and students to remember how many episodes of otitis media with effusion the student had. However, at least the students who had grommets will remember these and it is likely that if a student had a high number of episodes of otitis media with effusion they and their

parents will remember them. Doctor's records may need to be consulted. A further difficulty will be that those students who report no incidences of otitis media with effusion may in fact have had episodes of fluctuating, conductive hearing loss but without infection being present or without appropriate treatment..

Failure to control for the general state of health or other specific health problems will predispose to overestimates of the effects of otitis media with effusion.

By using only one school from which to draw the sample it is expected that control for socioeconomic factors and linguistic environment will be achieved.

The use of well developed tests especially in the learning area would decrease the chance of subjectivity on the part of the researcher being a validity problem. But it is possible that teacher marked written and spoken work samples will be used. If possible one experienced English teacher will be used to mark the samples. The use of questionnaires will be carefully monitored because it is possible to "find what one is looking for" and this will invalidate the study.

This study will be using retrospective data and it is possible that a biased sample will result because parents reading the initial letter requesting their permission may think that if their student did not have many or any episodes of otitis media with effusion then there is no reason for their student to take part in the research. Considerable consideration must be given to the wording of the initial letter requesting parental permission in order to avoid having a biased sample.

External Validity

The extent to which the results of this study can be generalised to other subjects and situations should be good. The sample will be large

and will include a number of students with and without a history of otitis media with effusion. Also it is controlled by the elimination of students with other diagnosed conditions which may lead to the same type of sequelae as otitis media with effusion.

Conclusion

According to the AHCPR Panel a key issue in research into otitis media with effusion is the association of this condition with long term adverse effects on speech and language development, learning and behaviour. Little is known about the effects that fluctuating, conductive hearing loss can have on the long term outcomes for otherwise normal children.

It is the purpose of this research to add to our present knowledge of the long term effects of fluctuating, conductive hearing loss as a result of otitis media with effusion.

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